A modified “far-lateral” approach for safe resection of retroodontoid dural cysts

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Abstract Cystic mass lesions at the ventral craniocervical junction have been described only rarely in the past, however, they have received more attention with improved imaging modalities in recent years. These lesions have been approached by various operative procedures. A modified “far-lateral” approach combined with a C1 hemilaminectomy without fusion was used to safely remove the cyst and decompress the cervical medulla in a 72-year-old woman with cervicooccipital pain and paresthesia in both arms. Following surgery, complete resolution of symptoms was achieved, and no recurrence at 1 year follow-up was detected. A modified “far-lateral” approach offers several advantages when compared with other operation techniques.

Keywords Intraspinal cyst · Retroodontoid · Dura mater · “Far-lateral” approach · Operation technique

Introduction

Cystic mass lesions at the ventral craniocervical junction have been thought to be exceedingly rare [6], although more reports have been published within the past few years [2, 4, 18, 19]. Owing to the rarity of these lesions, there is

no generally accepted terminology up to date and such cysts have been categorized as dural cysts or as synovial cysts associated with degeneration of the transverse ligament or arising from the atlantoaxial joint, occasionally in patients with atlantoaxial instability or rheumatoid arthritis [6, 9, 14]. Various surgical strategies have been reported to approach this lesion. Here, we describe the advantages of a modified “far-lateral” approach.

Case report

History

We present a case of a 74-year-old woman complaining of dizziness, pain in the cervicooccipital region and paresthesias in both arms. The neurological examination revealed minimal loss of strength on the right side. There was no history of rheumatoid arthritis, gout, pseudogout or psoriasis.

Imaging

MR imaging studies showed an $8 \times 9 \times 8$ mm extraaxial cystic lesion at C0/C1 ventral to the spinal cord that was compressed on the right side (Fig. 1a, b). There was no sign of instability on fusion/extension X-rays.

Surgical technique

Because the lesion was entirely ventral to the spinal cord, and since there was no instability, an approach with adequate exposure yet preserving joint integrity as far as possible was considered. For this purpose, a modified far-lateral approach was chosen. The patient was positioned

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Fig. 1 **a** Sagittal and **b** axial MR imaging studies show an $8 \times 9 \times 8$ mm extradural cystic lesion at C0/C1 ventral to the spinal cord which is compressed on the right side

prone with the head slightly flexed and rotated and fixed in a Mayfield clamp. A linear incision was made about 5 cm lateral to the midline. The occiput, the hemiarch of C1 and the vertebral artery on the right side were exposed via a muscle splitting approach. Then, the atlanto-occipital membrane was removed. The vertebral artery was mobilized and a C1-hemilaminectomy was performed. Thereafter, the most medial aspect (about 1/3) of the right occipito-atlantal joint was drilled away without additional opening of the foramen magnum. This allowed identification of the cyst without any retraction of the spinal cord. The cyst was opened and a clear yellow fluid was aspirated. After the cyst was collapsed, its wall could be detached gently from the dura and from the tectorial membrane.

Thus, complete removal of the cyst was achieved. A drain was inserted, and the skin was closed in a multilayer fashion.

Histology

The cytological and histological examination revealed a cavity filled with clear yellow fluid. The wall was composed of connective tissue with EMA-positive elements in the cyst wall.

Postoperative course

The patient's postoperative course was uneventful and all symptoms resolved. Postoperative X-rays including flexion/extension and rotation of the cervical spine did not indicate any instability and hypermobility. The patient, therefore, was discharged without a cervical collar or a brace. One year postoperatively, MR imaging was unremarkable. The neurological examination was normal.

Discussion

Spinal cystic mass lesions most frequently occur in the lumbar region adjacent to the facet joints [17]. If symptomatic, they can cause radicular symptoms mimicking a lumbar disc herniation. More rarely, they are found in the cervical region. When they occur in the craniocervical junction, they are located ventrally, where they may arise from the transverse ligament. In this localization, they may cause myelopathy, paraparesis, tetraparesis or gait disturbances. They have been variably classified as synovial cyst, dural cyst, pseudotumor, or degenerative articular cyst. Their development has not been clarified. They may be associated with trauma, instability or rheumatoid arthritis. Differential diagnosis includes tumors such as meningiomas or metastasis [7], rheumatoid arthritis or atypically enlarged vessels [10]. The natural course of these lesions is unknown. Three cases were reported who had conservative treatment only using a Philadelphia collar alone or in combination with anti-inflammatory drugs or with calcitonin. There was either no clinical change or improvement over 4 months [14].

Surgical treatment offers the advantage of early symptom improvement after appropriate decompression. Since the first report as published in 1988, several operative variants were described to reach this goal [1, 3–6, 8, 11–13, 15, 16, 20]. An overview of the literature is given in Table 1. Most approaches include total or subtotal removal of the cyst. Another option is posterior stabilization of C1/2 without cyst removal [4]. Whatever option was used,

Table 1 Different operative approaches as described in the literature for resection of retroodontoid cysts

Approaches	References	Number of patients	Postoperative outcome (follow-up)
Suboccipital craniotomy + C1 and C2 laminectomy	Onofrio and Mih [12], Miller et al. [11], Quaghebeur and Jeffree [13], Goffin et al. [8]	4	1 Pat. “normal neurological status” (72 m), Onofrio and Mih; 1 Pat. “strength and spasticity improved” (12 m), Miller et al.; 1 Pat. “improved”, Quaghebeur and Jeffree; 1 Pat. “significant amelioration of the symptoms (no follow-up), Goffin et al.
Suboccipital craniotomy + C1 laminectomy	Eustacchio et al. [5]	1	“Almost completely recovered” (33 m)
Transoral approach + C1 and C2 fusion	Choe et al. [3], Birch et al. [1]	3	1 Pat. “only residual weakness in the arms” (6 m), Birch et al.; 1 Pat. “full strength in all extremities” (10 m), Birch et al.; 1 Pat. “improved”, Choe et al.
C1 and C2 hemilaminectomy	Birch et al. [1], Zorzon et al. [20]	3	1 Pat. “mild numbness in both hands and able to walk” (12 m), Zorzon et al.; 1 Pat. “complete recovering” (18 m), Zorzon et al.; 1 Pat. “marked improvement of pain” (6 m), Birch et al.
C1 and C2 laminectomy	Birch et al. [1]	1	“strength was considerably improved” (6 m)
Posterolateral approach, partial drilling of the condyle + C1 and C2 hemilaminectomy	Fransen et al. [6]	1	“Good improvement, patient walks alone” (1 m)
C1–C2 transarticular fixation	Cihanek et al. [4]	1	“improvement”
C1 laminoplasty	Suetsuna et al. [15]	3	1 Pat. “recovery rate was 76.4%” (mean 29 m); 1 Pat. “Nearly complete remission of symptoms and recovery rate was 90.0%” (mean 29 m); 1 Pat. “Recovery rate was 94.7%” (mean 29 m);
MR-guided percutaneous fenestration	Takahashi et al. [16]	1	“No complaints” (9 m)

invariably improvement of clinical symptoms was noted. Side effects were low, in general. Not much information on longterm follow-up is available.

We think that the modified “far-lateral” approach as described here provides several advantages when compared with the other options described previously. As opposed to the classical far-lateral approach, there is no need for extensive opening of the posterior fossa. The risk of infection is lower when compared with the transoral approach. When compared with more extensive dorsal approaches, there is no need for fusion of C1 and C2. On the other hand, when considering more limited dorsal approaches, our approach obviates any spinal cord retraction providing sufficient working angle (Fig. 2). Under optimal visualization, radical resection can be achieved with good control of neighbouring structures. Overall, it constitutes a good compromise between a standard posterior approach and more destabilizing procedures.

With regard to the aging population in Western countries retroodontoid cysts should be expected to be more frequent in the future and they should be included in the

differential diagnosis of upper cervical myelopathy. As demonstrated in our case, they can be removed safely by a limited approach.

Fig. 2 Additional working space provided by a “far-lateral” approach drilling the most medial aspect of the atlanto-occipital facet joint (A) when compared with a muscle splitting approach (B) and the standard posterior approach (C)

Conflict of interest None of the authors has any potential conflict of interest.

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